

Brian Bergamaschi, Bryan Downing, Michael Sauer, U.S. Geological Survey, 6000 J St, Sacramento CA 95819-6129; p 916.278.3000; f 916.278.3071; [msauer@usgs.gov](mailto:msauer@usgs.gov); Peter Hernes, U.C. Davis, 1 Shields Ave, Davis CA 95616; p 530.752.7827; f 530.752.5262; [pjhernes@ucdavis.edu](mailto:pjhernes@ucdavis.edu)

## **Water and particle properties as measures of habitat quality**

**Abstract:** Aquatic habitat quality in the Delta is determined by interactions between nutrients, suspended sediment, water, and light. Together, these habitat attributes affect the food supply by controlling algal production and species distribution; affect the food web structure by influencing energy transfer and grazer community composition; and affect fish distributions by altering foraging behavior and predation. The variation in these attributes across the Delta is commonly observed as variations in, for example, chlorophyll, turbidity, and Secchi depth, which have been related to algal, zooplankton, and fish abundance. Our project examines these relationships in greater detail using a suite of new optical techniques that directly measure light transmission properties as well as algal and particle size and abundance. One purpose of the study is to identify the simplest optical water quality measurements that may best be used in a continuous real-time in-situ monitoring network of habitat quality. We conducted profile measurements and collected samples at 25 stations from Suisun Bay to Cache Slough in conjunction with the 2011 Fall Mid-Water Trawl program; sampling at the same time and location as the fish collection activities. We found a large tidal dependency and large spatial variability for the parameters measured. For example, the chlorophyll concentration and median size of large suspended particles (including algae and flocs) increased upstream, in contrast to turbidity and salinity which showed the opposite trend. Distributions and interactions between measured parameters will be presented in combination with results of more traditional water quality measurements and from analysis of discrete water samples. The optical measurements will be used as part of an effort to establish relationships between readily-measured habitat quality indices and direct measurements of fish and community structure.

**Statement of Relevance:** Study results can be used (1) to develop a monitoring network measuring habitat quality indices continuously at existing flow stations across the Delta, yielding input for decision support models and a real-time Delta habitat index; and (2) to examine spatial and historic patterns through use of remote sensing imagery. This will better inform policy makers and managers about effects of water operations, mitigation actions, and restoration activities.

**Statement of Relevance:** These data will be used to evaluate the hypothesis that river flow and Sacramento River ammonium concentration are significant regulators of primary production and phytoplankton nitrogen uptake in Suisun Bay. The results could be used in adaptive management of fall outflow for delta smelt protection and water supply reliability.